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(71) Applicant(s) E Lead Electronic Company Limited (Incorporated in Taiwan) No 52 Lane 563, Chang Tsao Road, Changhua City, Taiwan	(56) Documents Cited GB 2264613 A EP 0780991 A2 WO 98/17503 A1 WO 90/09706 A1 US 5418836 A
(72) Inventor(s) Stephen Chen	(58) Field of Search UK CL (Edition P) H4J JK, H4L LDA INT CL <sup>6</sup> B60R 11/02, H04B 1/08 1/38, H04M 1/04
(74) Agent and/or Address for Service Eric Potter Clarkson Park View House, 58 The Ropewalk, NOTTINGHAM, NG1 5DD, United Kingdom	

(54) Abstract Title  
Integrated mobile-phone hands free kit combining with vehicular stereo loudspeakers and having common power supply

(57) An integrated mobile-phone hands free kit which combines with existing vehicular stereo system and utilizes the high power and high performance audio output characteristics to provide a comfortable and high quality conversation environment in vehicles. The invention comprises a hands free electric circuit connected between a stereo sound source 30, audio loudspeakers 61 62, and audio mobile phone source 2. It is also connected between an electric power supply 33 and stereo power input wire 32. Therefore the need for additional electric power supply and sound output loudspeakers for the hands free kit has been eliminated. The hands free kit also has an automatic sound source selecting unit to allow the loudspeaker output to switch between a sound source and a conversation source and means to process the audio signal to simulate front originating sound fields.

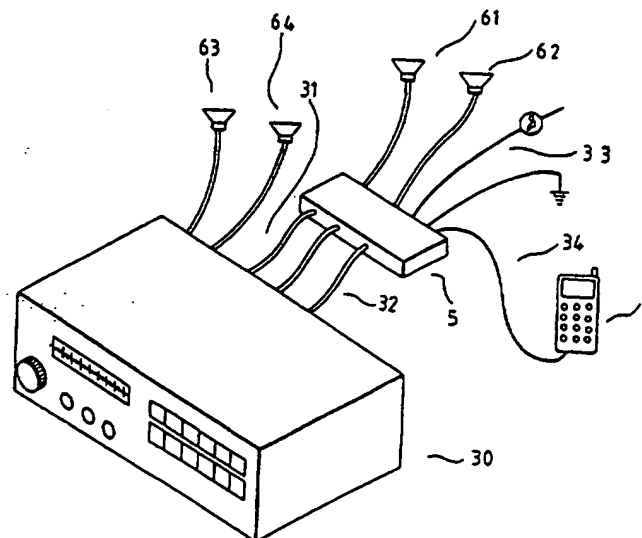


FIG. 2

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

This is a reprint to rectify errors introduced in the course of reproduction-Amended Claims added-29.02.2000

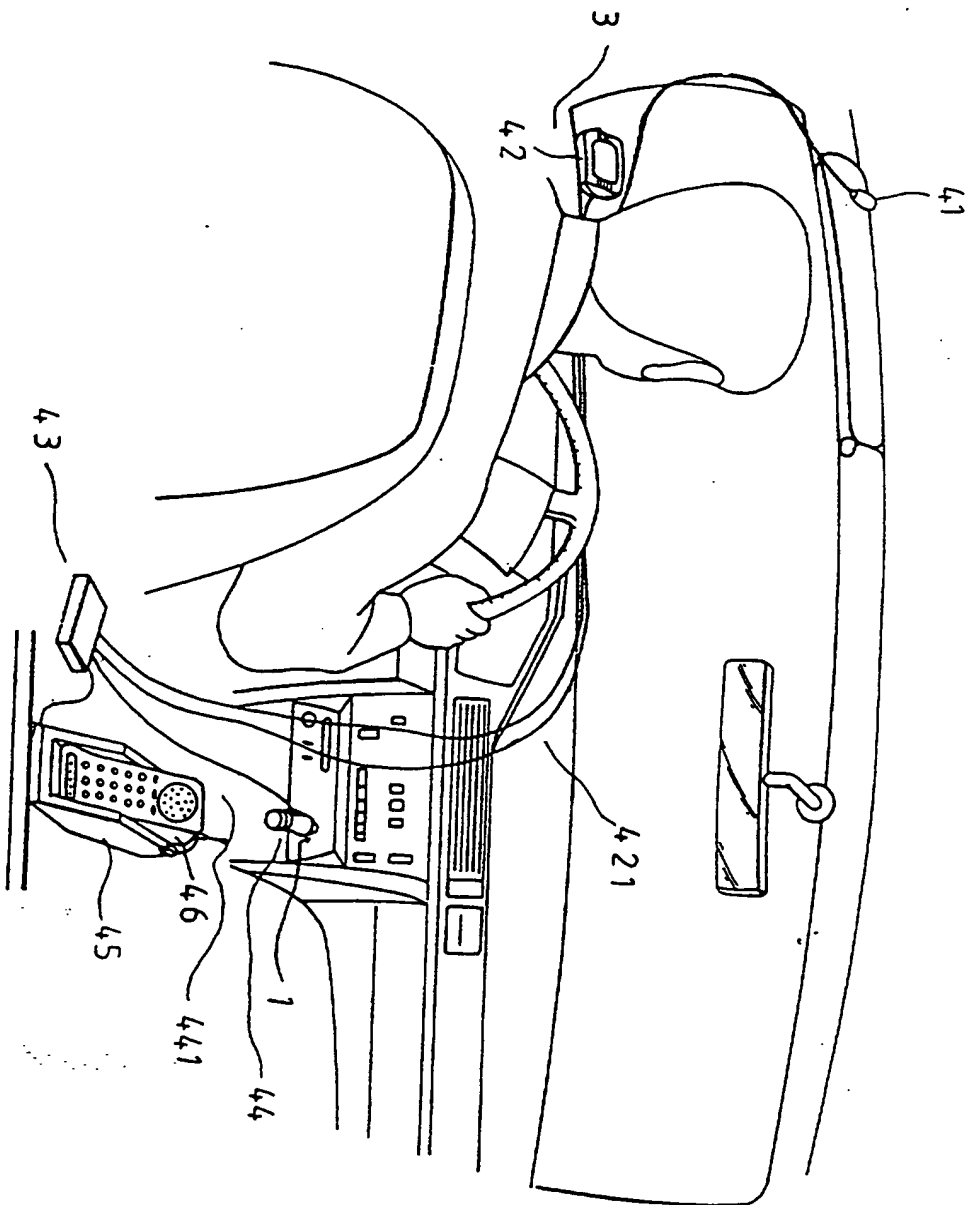
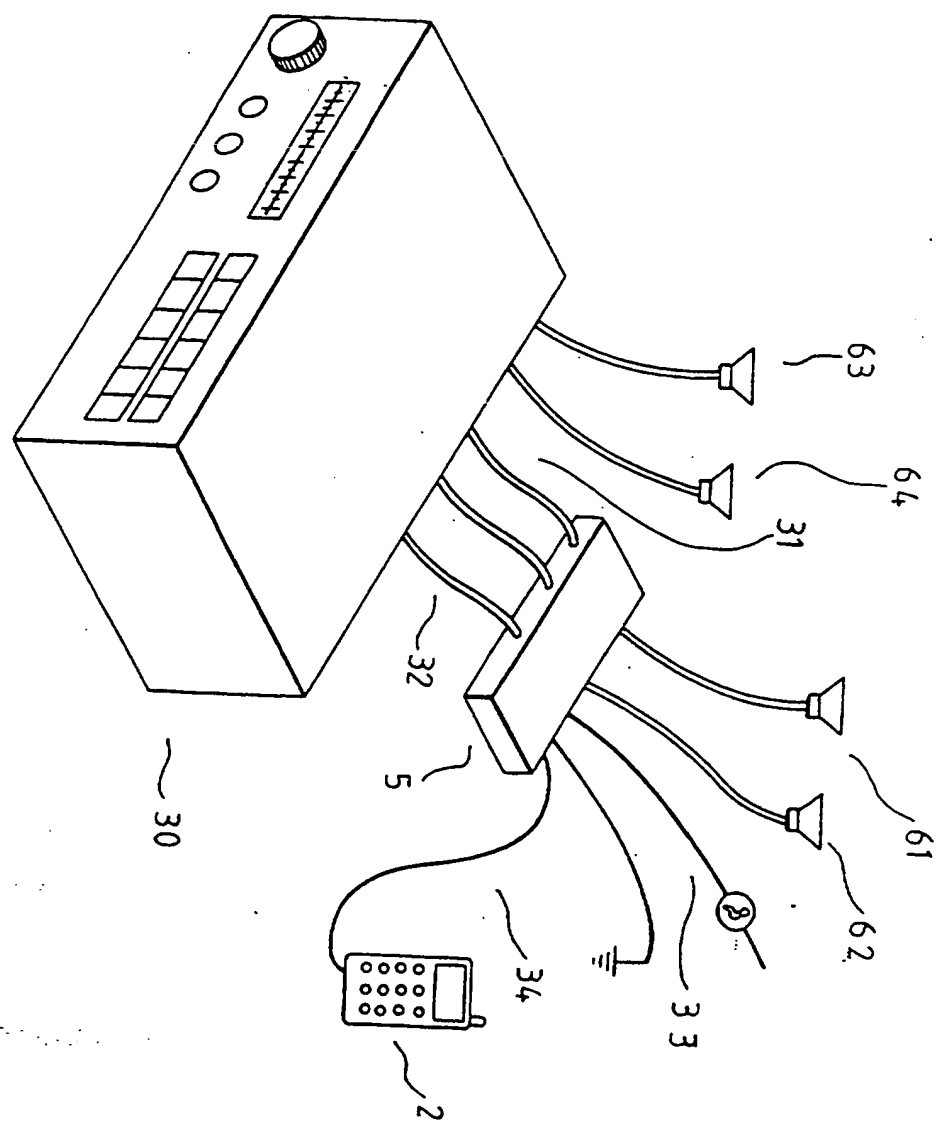


FIG.1  
PRIOR ART

26

FIG. 2



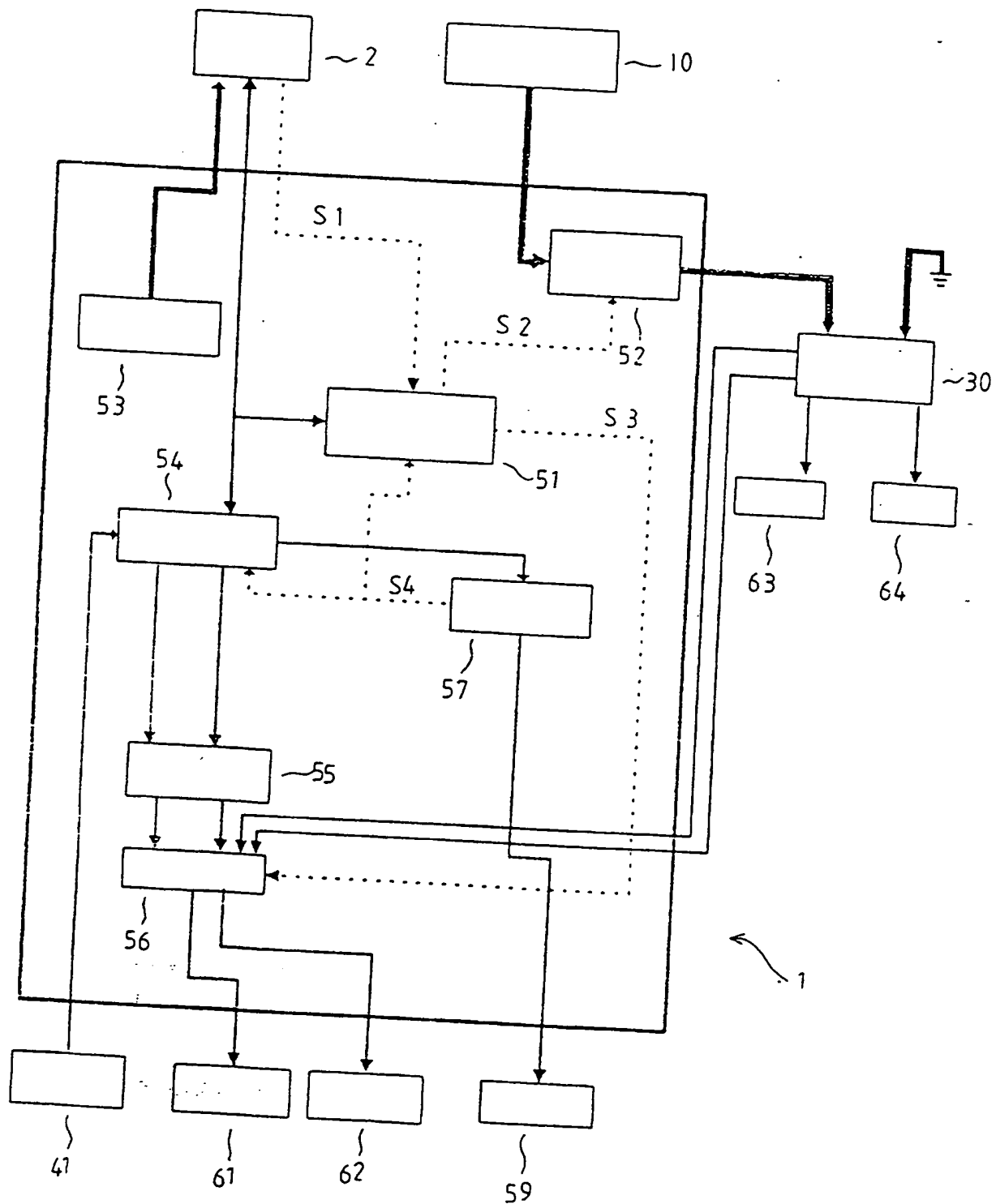


FIG. 3

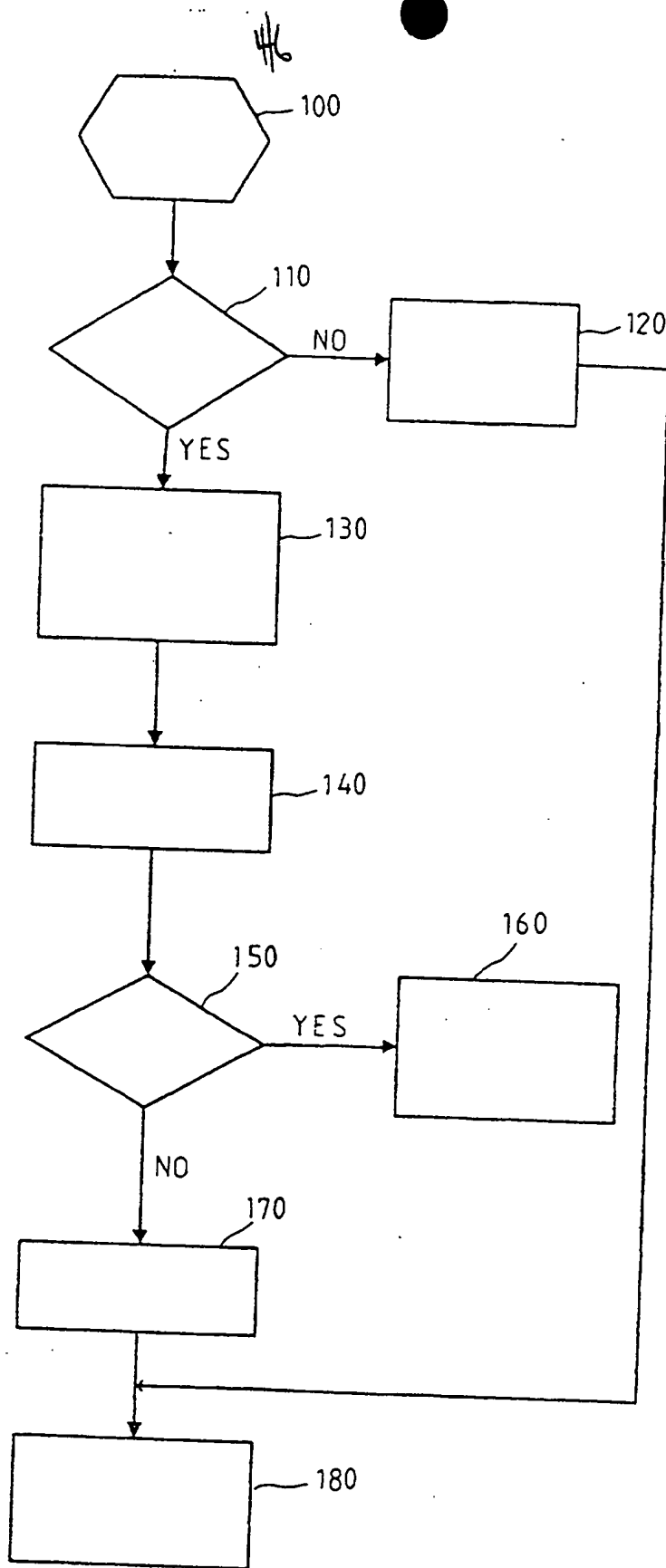


FIG. 4

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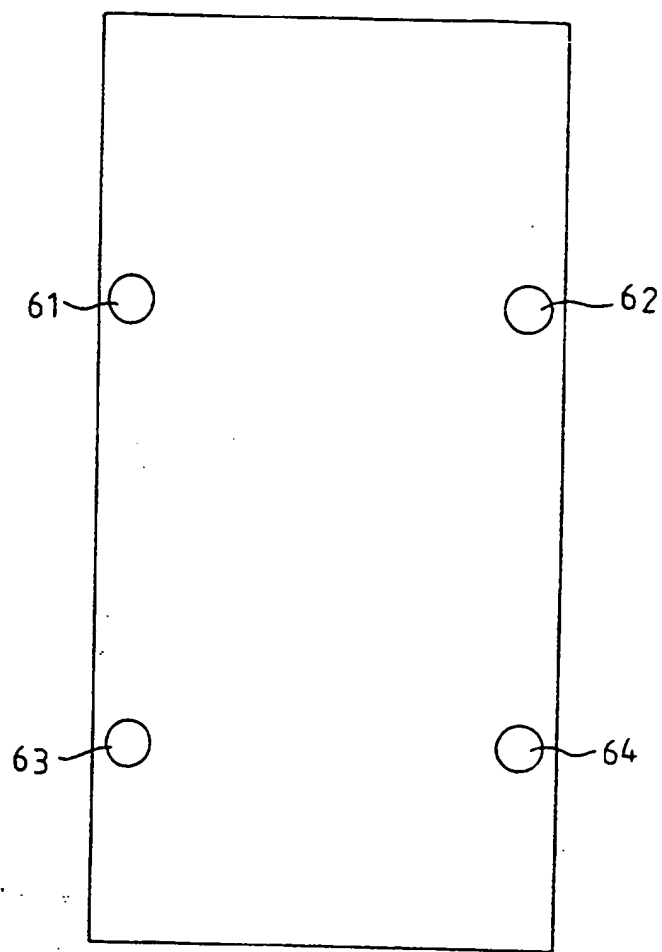


FIG. 5

66.

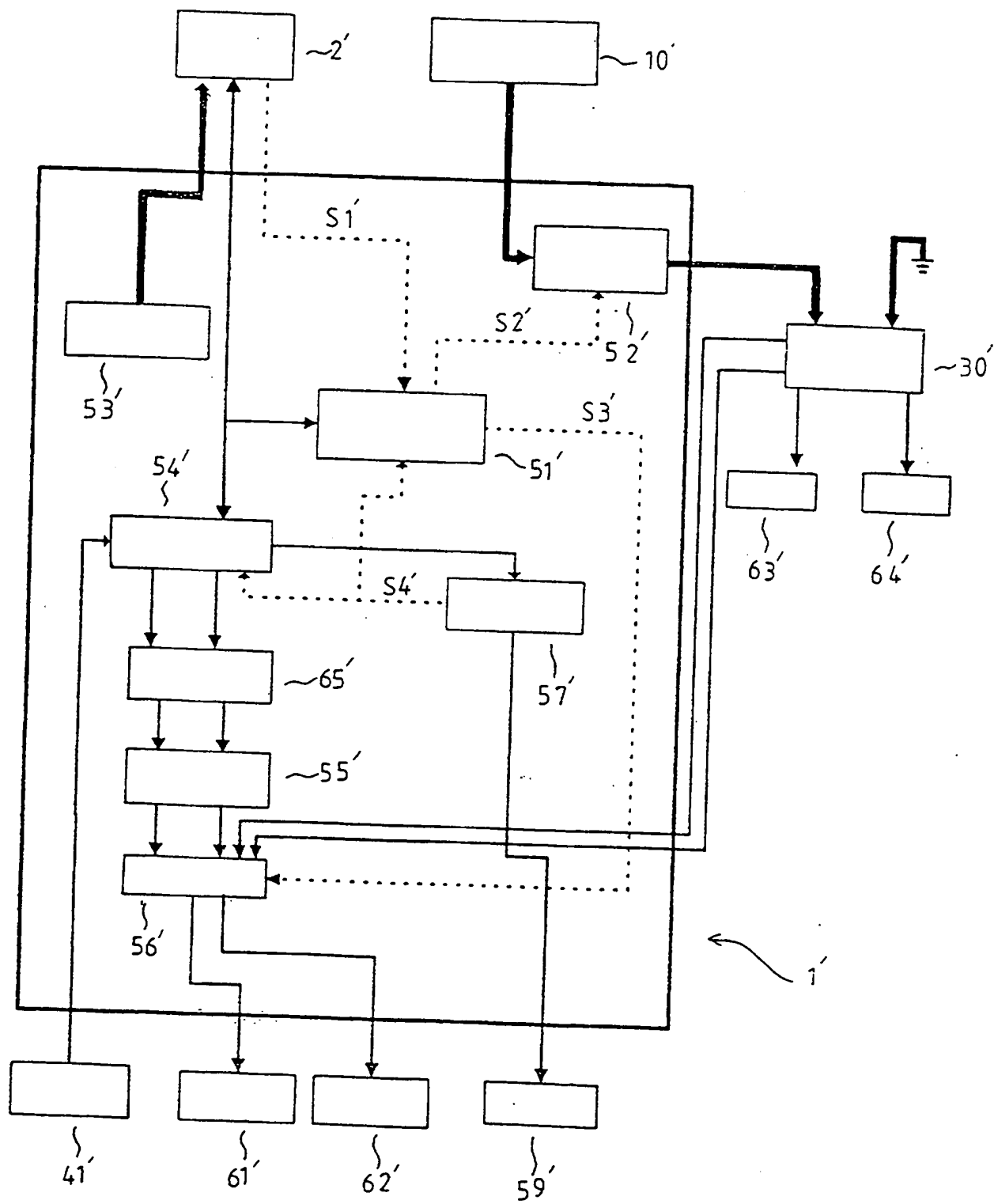


FIG. 6

## **BACKGROUND OF THE INVENTION**

### **FIELD OF THE INVENTION**

The present invention relates to an integrated handsfree kit of mobile-phone combining with existing vehicular stereo acoustic loudspeaker. More particularly, the present invention relates to an integrated mobile-phone handsfree kit which can utilize the high power and high fidelity characteristics of the existing vehicular stereo system, to power the mobile-phone handsfree kit with internal stereo power cord for simplifying interior wiring and power problem. The invention also detects and controls the sound source (stereo system or mobile-phone) for loudspeaker output and simulates the sound field of audio conversation to highly improve audio quality of wireless communication.

### **DESCRIPTION OF THE RELATED PRIOR ART**

Referring to FIG. 1, a conventional mobile-phone handsfree kit assembly



comprises a main electric circuit unit 43, a mobile-phone holder 45, a plug 44 engaging with a cigarette lighter 1, a microphone 41, a external loudspeaker 42 disposed on dashboard 3, and an electric power supply wire 441 connected between the plug 44 and the main electric circuit unit 43. A plurality of electric wires 421 which are disposed in an interior of a vehicle may be tangled together and causes driving interference. The mobile-phone holder 45 is to hold and fasten the mobile-phone set 46. Therefore, the conventional mobile-phone handsfree assembly is very inconvenient for the users to talk with mobile-phone while driving.

### SUMMARY OF THE INVENTION

The primary object of the present invention is to provide drivers an integrated communication system of mobile-phone handsfree kit combining with existing vehicular stereo equipment, which can utilize the sound output loudspeakers to provide excellent audio quality for conversation besides normal vehicular stereo function for entertainments.

It is also an object of the present invention to integrate the power supply of mobile-phone handsfree kit together with that of existing vehicular stereo system. The mobile-phone handsfree kit utilizes and shares the same existing internal electric power supply terminal of stereo system instead of extra wiring to simplify the installation and avoid multiple power supplies and wiring confusion.

It is also an object of the present invention to control and switche the loudspeaker output between a sound source of the stereo equipment and an conversation audio source of a mobile-phone, depending on whether the mobile-phone is in communication or not.

It is also another object of the present invention to control the loudspeakers in different locations by applying various output powers and phase delays for each loudspeaker in order to process the audio signal and simulate the sound fields as if the sound coming from the front.

Accordingly, an integrated mobile-phone handsfree kit combining with vehicular stereo loudspeaker system comprises a handsfree kit electric circuit assembly and pre-installated loudspeakers. The mobile-phone handsfree kit electric circuit assembly is an interface of both audio signal stream and power supply. As to audio signal interface, it is disposed between a sound output signal wire from stereo or from mobile-phone and a sound output loudspeaker. As to power supply interface, it is disposed between an electric power supply wire of stereo system and an electric power input wire from vehicular power supply system. The handsfree kit electric circuit assembly and vehicular stereo equipment thereby share the same electric power supply and audio output loudspeakers. The handsfree kit electric circuit

assembly controls and switches the loudspeaker output between a sound source of the stereo equipment and an conversation audio source of a mobile-phone. The handsfree electric circuit assembly does not need an additional electric power supply as conventionally from cigarette lighter plug and an additional external audio output loudspeaker.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective schematic view illustrating a conventional mobile-phone handsfree assembly of the prior art installed in an interior of a vehicle;

FIG. 2 is a perspective assembly view of a vehicular stereo equipment and a mobile-phone handsfree kit combining with an existing vehicular loudspeaker of a first preferred embodiment in accordance with the present invention;

FIG. 3 is a block diagram of an integrated mobile-phone handsfree kit combining with a vehicular loudspeaker of a first preferred embodiment in accordance with the present invention;

FIG. 4 is a flow chart illustrating an operation of an integrated mobile-phone handsfree kit combining with a vehicular loudspeaker of a first preferred embodiment in accordance with the present invention;

FIG. 5 is a schematic view illustrating normal four-loudspeaker set of vehicular stereo system disposed in a vehicle; and

FIG. 6 is a block diagram of an integrated mobile-phone handsfree kit combining with a vehicular loudspeaker of a second preferred embodiment in accordance with the present invention.

### DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. 2 to 5, an integrated mobile-phone handsfree kit combining with a vehicular stereo loudspeaker system comprises a vehicular stereo equipment 30, and an electric power and control module 1 connected to the stereo equipment 30. The vehicular stereo equipment 30 is then connected to a sound output wire 31 and an electric power supply input wire 32. The electric power and control module 1 comprises a handsfree kit electric circuit assembly 5. The handsfree kit electric circuit assembly 5 is an audio and power supply interface which is disposed between the sound output wire 31 and a first loudspeaker 61 and a second loudspeaker 62. It is also connected between an electric power supply wire 33 and the stereo power supply input wire 32. The handsfree kit electric circuit assembly 5 and the stereo equipment 30 thereby share an electric power supply, the first loudspeaker 61 and the second loudspeaker 62. The handsfree kit electric circuit assembly switches and directs the loudspeaker output between a sound source of the stereo equipment 30 and an audio

source of a mobile-phone 2 according to an operation of the mobile-phone 2 communication. The handsfree kit electric circuit assembly 5 thereby eliminates the need for an additional electric power supply and an additional external sound output loudspeaker.

The handsfree kit electric circuit assembly 5 comprises a sound source control unit 51, an electric power supply switch 52, an electricity power supply unit 53, an audio fidelity processing unit 54, a power amplifier 55, a sound source selecting switch unit 56, and an earphone circuit 57. The sound source control unit 51 detects and recognizes whether the mobile-phone 2 is in operation for communication or not, in order to actuate the electric power supply switch 52. The electric power supply switch 52 is actuated by the sound source control unit 51 in order to turn on and turn off an electric power supply of the stereo equipment 30 temporarily. The electricity power supply unit 53 provides electricity for the mobile-phone 2 and also charges the battery of the mobile-phone 2. The audio fidelity processing unit 54 cancels an input acoustic echo and processes audio signal in order to maintain the high fidelity of audio quality. The power amplifier 55 amplifies an output audio signal of the mobile-phone 2 to an accepted sound level. The sound source selecting switch unit 56 is actuated by the sound source control unit 51 in order to detect and control whether a sound source of a sound output loudspeaker coming from the power amplifier 55 or from the stereo equipment 30. A first control line S1 is connected to the sound source control unit 51 and the mobile-phone 2. A second control line S2 is connected to the sound source control unit 51 and the electric power supply switch 52. A third control line S3 is connected to the sound source control unit 51 and the sound source selecting switch unit 56. A fourth control line S4 is connected to the earphone circuit 57, the audio fidelity processing unit 54, and the sound source control unit 51. A microphone 41, the first loudspeaker 61, the second loudspeaker 62, and an earphone 59 are all connected to the handsfree kit electric circuit assembly 5. A third loudspeaker 63 and a fourth loudspeaker 64 are both connected to the vehicular stereo equipment 30. The vehicle ignition 10 is connected to the electric power supply switch 52.

Now referring to FIG. 4, the operation flow chart of the integrated mobile-phone handsfree kit comprises the following steps:

Step 100: Start.

Step 110: The sound source control unit 51 detects and determines whether an incoming phone call is received.

Step 120: Keep the stereo equipment 30 operating.

Step 130: The electric power supply switch 52 shuts off the stereo equipment 30.

Step 140: The audio fidelity processing unit 54 eliminates the noise and cancels the acoustic echo to maintain the high fidelity of audio quality.

Step 150: The earphone 59 is connected to the earphone circuit 57.

Step 160: Output sound signal via the earphone 59.

Step 170: The power amplifier 55 amplifies an output audio signal of the mobile-phone 2.

Step 180: The sound source selecting switch unit 56 selects and determines a predetermined loudspeaker to output the sound signal. The sound source selecting switch unit 56 is controlled by the sound source control unit 51.

Referring to FIG. 6, another mobile-phone assembly comprises a stereo equipment 30', and an electric power and control module 1' connected to the stereo equipment 30'. The stereo equipment 30' comprises a sound output wire 31' and an electric power supply input wire 32'. The electric power and control module 1' comprises a sound source selecting switch unit 56', an adjustment/control unit 65', a power amplifier 55', an earphone circuit 57', an audio fidelity processing unit 54', an electricity power supply unit 53', a sound source control unit 51', and an electric power supply switch 52'. A first control line S1' is connected to the sound source control unit 51' and the mobile-phone 2'. A second control line S2' is connected to the sound source control unit 51' and the electric power supply switch 52'. A third control line S3' is connected to the sound source control unit 51' and the sound source selecting switch unit 56'. A fourth control line S4' is connected to the earphone circuit 57', the audio fidelity processing unit 54', and the sound source control unit 51'. A microphone 41', the first loudspeaker 61', the second loudspeaker 62', and an earphone 59' are all connected to the electric power and control unit 1'. A third loudspeaker 63' and a fourth loudspeaker 64' are both connected to the vehicular stereo equipment 30'. The vehicle ignition 10' is connected to the electric power supply switch 52'. The adjustment/control unit 65' controls the loudspeakers in different locations applying various output powers and phase delays for each loudspeaker in order to process the audio signal and simulate the sound fields as if the sound coming from the front.

The present invention is not limited to the embodiment mentioned above, but a variety of modifications thereof may be made for other applications. Further, various variations in form and detail may be made without departing from the scope of the present invention.

## WHAT IS CLAIMED IS

1. An integrated mobile handsfree kit combining with vehicular stereo loudspeaker system comprises:

A handsfree kit electric circuit assembly as an interface of both audio signal stream and power supply, and pre-installed loudspeakers.

The mobile-phone handsfree kit electric circuit assembly is, as for audio signal interface, disposed between a sound output signal wire from stereo or from mobile-phone and a sound output loudspeaker.

The mobile-phone handsfree kit electric circuit assembly is, as for power supply interface, disposed between an electric power supply wire of stereo system and an electric power input wire from vehicular power supply system. It thereby shares the same electric power supply and audio output loudspeakers with vehicular stereo equipment.

The handsfree kit electric circuit assembly controls and switches the loudspeaker output between a sound source of the stereo equipment and an conversation audio source of a mobile-phone, depending on whether the mobile-phone is in communication or not.

Wherein the handsfree electric circuit assembly does not need an additional electric power supply as conventionally from cigarette lighter plug and an additional external audio output loudspeaker.

2. The integrated mobile-phone handsfree kit combining with existing vehicular stereo loudspeaker as claimed in claim 1, wherein the handsfree kit electric circuit assembly comprises a sound source control unit, an electric power supply switch, an electricity power supply unit, an audio fidelity processing unit, a power amplifier, a sound source selecting switch unit, and an earphone circuit. The sound source control unit detects and recognizes whether the mobile-phone is in operation for communication or not, in order to actuate the electric power supply switch. The electric power supply switch is actuated by the sound source control unit in order to turn on and turn off an electric power supply of the stereo equipment temporarily. The electricity power supply unit provides electricity for the mobile-phone and also charges the battery of the mobile-phone. The audio fidelity processing unit cancels an input acoustic echo and processes audio signal in order to maintain the high fidelity of audio quality. The power amplifier amplifies an output audio signal of the mobile-phone to an accepted sound level. The sound source selecting switch unit is actuated by the sound source control unit in order to detect and control whether a sound source of a sound output loudspeaker coming from the power amplifier or from the stereo equipment.

3. The integrated mobile-phone handsfree kit combining with existing vehicular stereo loudspeaker as claimed in claim 1, wherein the handsfree kit electric circuit assembly comprises the adjustment/control unit controls the loudspeakers in different locations by applying various output powers and phase delays for each loudspeaker in order to process the audio signal and simulate the sound fields as if the sound coming from the front to make drivers concentrated to traffic situation while in conversation via mobile-phone.

## WHAT IS CLAIMED IS

1. An integrated mobile handsfree kit combining with vehicular stereo  
loudspeaker system comprises a handsfree kit electric circuit assembly as  
an interface of both audio signal stream and power supply, and pre-  
5 installed loudspeakers, wherein:

the mobile-phone handsfree kit electric circuit assembly is, as for  
audio signal interface, disposed between a sound output signal wire from  
stereo or from mobile-phone and a sound output loudspeaker;

10 the mobile-phone handsfree kit electric circuit assembly is, as for  
power supply interface, disposed between an electric power supply wire of  
stereo system and an electric power input wire from vehicular power  
supply system; and

the handsfree kit electric circuit assembly controls and switches the  
15 loudspeaker output between a sound source of the stereo equipment and a  
conversation audio source of a mobile-phone, depending on whether the  
mobile-phone is in communication or not.

2. The integrated mobile-phone handsfree kit combining with existing  
20 vehicular stereo loudspeaker as claimed in claim 1, wherein the handsfree  
kit electric circuit assembly comprises a sound source control unit, an  
electric power supply switch, an electricity power supply unit, an audio  
fidelity processing unit, a power amplifier, a sound source selecting switch  
unit, and an earphone circuit and wherein:

25 the sound source control unit detects and recognizes whether the  
mobile-phone is in operation for communication or not, in order to actuate  
the electric power supply switch;

the electric power supply switch is actuated by the sound source control unit in order to turn on and turn off an electric power supply of the stereo equipment temporarily;

the electricity power supply unit provides electricity for the mobile-  
5 phone and also charges the battery of the mobile-phone;

the audio fidelity processing unit cancels an input acoustic echo and processes audio signal in order to maintain the high fidelity of audio quality;

the power amplifier amplifies an output audio signal of the mobile-  
10 phone to an accepted sound level; and

the sound source selecting switch unit is actuated by the sound source control unit in order to detect and control whether a sound source of a sound output loudspeaker coming from the power amplifier or from the stereo equipment.

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3. The integrated mobile-phone handsfree kit combining with existing vehicular stereo loudspeaker as claimed in claim 1, wherein the handsfree kit electric circuit assembly comprises an adjustment/control unit which controls the loudspeakers in different locations by applying various output  
20 powers and phase delays for each loudspeaker in order to process the audio signal and simulate the sound fields as if the sound is coming from the front to make drivers concentrate on the traffic situation while in conversation via mobile-phone.





Application No: GB 9813163.4  
Claims searched: 1 to 3

Examiner: Elizabeth Rolfe  
Date of search: 30 October 1998

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.P): H4J (JK), H4L (LDA)

Int CI (Ed.6): B60R 11/02, H04B 1/08, 38, H04M 1/04.

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
XY	GB 2264613 A (PIONEER)	1
XY	EP 0780991 A2 (MARTIN)	1
XY	US 5418836 A (YAZAKI) see column 2 lines 9-20 and column 4 line 10.	1
XY	WO 98/17503 (MILBOURN)	1
XY	WO 90/09706 (IN-CAR SYSTEMS)	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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